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THE ORIGIN AND PURPOSE OF THE HORNS AND ANTLERS OF RUMINANTS.

By Allan Gordon Cameron.

(Concluded from p. 252.)

III. Structure.

History favours the view that horns and antlers were aboriginally protective weapons, and an examination of their structure reveals the fact that they are protective in a double sense—as an adjustment, on the one hand, to preserve the species from destruction by external enemies in the struggle for life, and, on the other hand, to save it from self-destruction through sexual combat in the struggles of rivalry for possession. I propose to take these points in order.

(1). Considered as an adaptation for defence, and notwithstanding diversity of forms due to generic and specific divergence, the frontal weapons of ruminants appear to be fashioned upon one or other of two main types which may be defined from their structural relation to the skull as either *vertical and parallel* or *transverse and crescentic*. In the first-named type, which chiefly distinguishes the Antelopes, and attains a characteristic development in the genera *Strepsiceros*, *Oryx*, *Hippotragus*, the cranial weapons rise vertically from the skull, and whether lyrate, spirally twisted, straight, or recurved, are relatively parallel to one another and to the cranio-facial axis which falls between them. In the last-named type, which chiefly distinguishes the Deer and Oxen, and attains a characteristic development in the genera *Bos* and *Cervus*, the cranial weapons diverge laterally from the skull, are set transversely to the cranio-facial axis, and usually assume a crescentic form, of which the terminal points may be directed upwards, as in most antlers and some horns, or inclined forwards, as in most horns and some antlers. The Sheep and Goats, which are of comparatively late appearance in geological time, exhibit a gradual and complete transition from one type to the other.*

That weapons of both types are an efficient means of defence against carnivorous attack, is a fact generally recognised, and sufficiently established by the constant experience of hunters; but the marked structural difference between the more specialised examples in either case, suggests a functional importance, and favours the conclusion that each type commands a relatively greater efficiency in dealing with a particular form of attack. Weapons that rise vertically and diverge but slightly from the line of the facial axis present a resisting force to a direct impact which seems peculiarly adapted to meet the attack of carnivores that creep on their prey by stealth and seize with a spring (*Felidæ*); while weapons that spread laterally and diverge widely, give a sweeping reach to the swing of the armed head which seems peculiarly adapted to meet the attacks of carnivores that hunt their prey in packs and kill by mobbing (*Canidæ*). It is therefore a significant fact that from Pliocene times the Antelopes have been associated mainly with a fauna of deserts and plains and with a predominant feline carnivora; while the Deer and Oxen for the same period have been associated mainly with a fauna of forests and hills and with a predominant canine carnivora. Illustration of this particular defensive use of either type may be found, on the one hand, in the lowered head of the kneeling Gemsbok, who thus awaits and averts the threatened attack of the Lion; and, on the other hand, in the familiar spectacle of the hunted stag at bay swinging his antlered head before a pack of hounds. That the complex branching of antlers is a further and formidable adjustment for a defensive purpose, will be questioned by no one who endeavours to come to terms with a wounded Deer so long as he can use his head;

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* Transverse types occur among the Antelopes, and vertical types among the Deer and Oxen, but the general *facies* of the frontal weapons in both cases is the other way, as may be seen from any extensive series of either.

BRITISH MUSEUM

and even those phenomena of variation, whether in horns or antlers, which concern the varying organism rather than the modifying conditions, may lead us from our definitions of genera and species to reflect upon the pregnant remark of Weismann, that "the struggle for existence does not cease with the foundation of a new specific type, or with some perfect adaptation to the external or internal conditions of life, but it becomes, on the contrary, even more severe, so that the most minute differences of structure determine the issue between life and death."

(2). The passionate energy of sexual combat among polygamous and gregarious animals inclines the imagination to picture fatal results which are, nevertheless, without foundation in fact. Careful and repeated observation in the case of species endowed with combative instincts, and armed with formidable weapons, unquestionably attests the conclusion that injuries of any kind are rare, that fatal results are exceptional, that even the want of weapons is no barrier to mastership. Such a conclusion will not surprise when we review the structural types, which are a common character of cranial weapons, in relation to the method of sexual warfare, which is the common heritage of ruminants; and recall the difficulties that Darwin felt in attempting to explain the one as an adaptation to the purpose of the other. In a conflict which resolves itself into a butting and pushing match with forehead pressed to forehead, weapons interlocked with weapons, and the issue decided not by force of arms, but by wind, and weight, and persistent endurance, horns and antlers, whether set transversely to the facial axis or vertically extended in line with it, can play but an insignificant part or none at all. The rare occasions of death appear to indicate that the fatal thrust was dealt in pursuit as the beaten opponent turned his flank in flight.

Illustration of sexual warfare through all groups would be desirable, but does not occur in the recorded experience of hunters, and in the circumstances it could hardly be otherwise. The absence of evidence chiefly affects the Antelopes, in regard to which Mr. Selous,* in his nine years' 'Wanderings in Africa,' notes nothing on the present subject save "a dead Situtunga ram that had been killed, apparently by a rival," and exhibited "a deep wound in the side, just behind the ribs." In other groups, however, sufficient examples are forthcoming to substantiate the previous statement, varying in extent of information, but valuable in the cumulative effect of their agreement.

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* Should these lines meet the eye of Mr. Selous, the result of that distinguished hunter's experience on the subject would be greatly valued by the present writer.

Among the Oxen, the Buffaloes of India and Africa are distinguished by the calibre of their horns no less than by the ferocity of their disposition, and their sexual combats are proportionately determined. Sir Samuel Baker tells us that he "frequently witnessed such battles between old bulls," but makes no record of serious injury or death in the result. "In such trials of strength the vanquished party generally retreats at full speed, followed for a certain distance by its adversary, who endeavours to drive his horns into the posterior. This is a difficulty, as the great curvature of the horns renders a direct thrust impossible." On one occasion the fierce antagonists had interlocked their horns, and, ranging side by side in their efforts to pull clear, were killed by the enterprising sportsman with a single bullet.

In regard to Deer, the remarks of Caton upon the Wapiti confined in his park at Ottawa, Illinois, possess a special interest, because they have particular reference to a question put by Darwin concerning the utility of branched antlers as sexual weapons. After a brief description of the mode of joining battle, and of the care taken to secure accurate information, Caton concludes as follows:—"In none of the battles which have been witnessed in my grounds has either combatant sustained injury, so that I cannot explain the incidents of those which have been accompanied with fatal results (two cases previously mentioned), but probably some obstacle has intervened which prevented the escape of the vanquished, which has always been effected when the contests have been observed." The same writer was an eyewitness of a "terrific battle" between white-tailed bucks, which lasted for two hours without the animals being once separated," at the close of which, "I could not," he tells us, "detect a scratch upon either sufficient to scrape off the hair, and the only punishment suffered was fatigue, and a consciousness of defeat by the vanquished. Parallel with these statements, it is instructive to compare the protective use of antlers in defence, as illustrated by a Wapiti stag in the same park, which, having killed one man and treed two others, subsequently held at bay for a considerable period a rescue party composed of three resolute men, each armed with a pitchfork and stimulated by the expectation of saving life.

No cervine species, however, has been made the subject of such full and satisfactory observation as the wild Red-deer among the bare hills of North Britain, where, as Sir Samuel Baker has remarked with truth, "the great numbers of Deer, and the facilities for acquiring a knowledge of their habits, offer a more than ordinary advantage, and yield information that would be difficult to obtain elsewhere." The comparative indifference of frontal weapons in sexual combat between individuals of a species is here forcibly illustrated by the fact that neither abnormality nor absence of cranial armature constitutes any apparent hindrance to success in battle. Stags with one antler recurved goat-like, or with both antlers abnormally fashioned in this way, or with a single, though normal, antler, or without antlers at all, are found to win and hold their harem against normally armed stags of similar size and weight, and to meet and conquer these, not on occasion only, but year by year on their own beat, till overcome in turn by a younger stag or killed with a bullet. Ears are split and eyes are sometimes put out, as shown by occasional one-eyed stags, and sometimes a point may reach the brain through the cavity of the orbit, or gore the flank of the beaten Deer as he turns to run; but, omitting the split ears, the above are exceptional cases, and it seems a probable estimate that, on an average of seasons, not more than one stag out of two hundred will meet his death by fighting.* The rarity of sanguinary hurts or fatal injuries has, in fact, been a subject of surprise to the careful observer since the days of the Stuarts half-a-century ago.

In regard to the sexual combats of Sheep, anyone who happens to witness a fight between black-faced Highland rams in the breeding season will satisfy himself that the ponderous horns play no part in the transaction, the fight throughout partaking of that character which the battering-ram has rendered famous in the ancient history of nations. Even as a guard to the forehead the horns of the Highland Sheep avail him nothing in a bout with the hornless Leicester; nor do the admired weapons of the Highland Ox secure him from defeat by the polled skull of the more massive Galloway.

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* This estimate refers to the fighting stags only, and was suggested (at my request) by a gentleman who has investigated in detail the amount and causes of natural death among wild Red-deer, and to whom I am also indebted for the preceding facts, all of which have come under his personal observation.

These and the foregoing facts point to but one conclusion—that frontal weapons, which were originally protective, have been structurally conditioned by natural selection during their development so as to become protective in the double sense of an adjustment, on the one hand, to preserve a species from destruction by external enemies in the struggle for life, and, on the other hand, to save it from self-destruction through sexual combat in the struggles of rivalry for possession. Had it been otherwise, the horned and antlered genera must have been suicidally exterminated in turning against each other the fatal weapons to which, under existing circumstances, they owe their ultimate survival.

The periodical shedding and renewal of antlers appears to conflict with the theory of their protective origin, and to favour the view which would associate them with the exercise of the sexual function; but the apparent difficulty is found to rest upon a narrow basis of facts, and disappears as we extend our horizon in space and time, geographically and historically. Frontal weapons, whether permanent or deciduous, and both in the male and the female, bear a more or less intimate relation to the reproductive system; but there is no reason to assume a special correlation between the shedding of antlers and the exercise of the sexual function, since observation and experiment have conclusively shown (1) that in the individual Deer this function is exercised independently of the presence or absence of antlers, and (2) that the shedding of antlers does not follow as a consequent upon the period of rutting, being subject to indefinite variation in different species. Palæontological investigation has taught us that the shedding of the velvet, and of the antler, are inherited characters conditioned by the structure of earlier and permanent weapons from which both horns and antlers were aboriginally developed; and the periods of shedding, among the Deer of Tertiary times, so far as they can be determined from the facts at our disposal, were of quite indefinite recurrence, as with certain species in tropical India to-day. "Throughout the Tertiary period tropical conditions prevailed far into the temperate regions" (Wallace); and it is significant that, "with one exception, all the Pliocene Deer which can be brought into relation with living forms are closely allied" to existing Oriental species (Boyd Dawkins). Of Sambur and Axis we read in Mr. Blanford's authoritative work, 'The Fauna of British India,' that "stags with perfect antlers may be found at all seasons," and of the first-named Deer, which represents the most widely-distributed Oriental species, that "individual stags retain their horns for successive years." These facts have an important bearing upon the protective value of antlers to the Tertiary Deer, for they enable us to infer the constant presence of armed males in a herd.

Why the Deer of temperate regions carry their antlers for not more than eight or nine months, and the circumpolar species only for three or four, is a question which claims further investigation; but the ascertained facts lend great probability to Prof. Martin Duncan's view that the creeping in of a colder climate at the close of the Tertiary period, affecting the blood-supply so as to induce a failure of nutrition, caused antlers that were relatively permanent in the Pliocene tropics to become relatively deciduous during the glacial conditions that supervened.*

IV. SEX.

Weapons which owe their origin and purpose to protective adaptation must have been profitable to both sexes, and their variable presence or absence in the females of genera and species whose males possess them, universally requires explanation from the standpoint of the previous argument. A solution of the problem will be found in the physiological antagonism between growth and reproduction, which seems to have been overlooked by the theory of sexual selection, but which nevertheless, in the higher mammalian organisation, lies at the root of all the more distinctively sexual characters. In the organic economy of the male the sum of vital force is expended on self-maintenance, and growth continues till expenditure nearly balances nutrition; in the organic economy of the female there is a reserve of vital force to meet the cost of reproduction, and growth is arrested "while there is yet a considerable margin of nutrition, for otherwise there could be no offspring" (Herbert Spencer). I think it probable that frontal weapons of a simple type and for the common purpose of defence were aboriginally developed without distinction of sex, though not necessarily by both sexes and not necessarily by either; but I think it certain that the development of such weapons must have been differently modified from the outset by the physiological organisation proper to either sex. In females the recurrent strain of parturition, suckling, and anxious maternity would tend to arrest the development of cranial structures necessitating for their effective maintenance a large expenditure of vital force; would tend, in the continuously severer struggles for life, to promote their loss by retrogression consequent upon the paramount claim and higher utility of rearing vigorous offspring; and would tend, in any case, to throw the burden of protection primarily upon the males, to the development of whose weapons, whether horns or antlers, physiology would offer no check and natural selection would afford a constant stimulus, the calibre of the weapon being directly conditioned by the struggle for life. Female horns and antlers therefore represent a compromise between conflicting forces, maternal and self-protective, whose variable incidence, according to the reaction of diverse constitutions upon diverse conditions of life, has produced a variable resultant, and added a new factor to the problem; so that the quesion, whether protectve weapons are profitable to the female sex, becomes subordinate to the further inquiry, how far the development of such weapons may have been compatible with the complete fulfilment of the maternal functions?

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* The origin of deciduous weapons must be sought in the wider subject of physiological regeneration. Power to renew a lost part is present in various groups of animals, though in different degree, and is probably due to adaptation through selection, as suggested by Prof. Weismann, who points out, in support of his view, that the capacity for regeneration appears specially in parts which are of biological importance, and are at the same time exposed to frequent injury or loss. From the fact that primitive antlers were constitutionally brittle and liable to separation by fracture, while valuable as a means of defence, it seems legitimate to infer that some physiological stimulus, similar to that which provides the Lizard with a new tail, must have provided the Miocene Deer with new antlers. The burr, or coronet, of to-day marks the original point of fracture and subsequent seat of renewal, the skin-covered pedicel having survived (so to speak) *in statu quo*.

The view that frontal weapons were aboriginally developed by both sexes in a majority of ancestral types finds support in the relative facts as presented by the natural history of existing ruminants. Modern zoology sanctions a division of surviving Pecora (true ruminants) into four groups of family rank,—the Deer, the Giraffes, the Pronghorns, and the Cattle,—of which the Giraffes are allied to the Deer, and the Pronghorns to the Cattle; and females with horns or antlers appear in every group, and in the older sections of the larger groups. To-day a single surviving species represents the Giraffes, which were nevertheless an abundant group in Pliocene times; as also the Pronghorns, which recall in the structure of their characteristic weapons a Miocene transitional and primitive type. Of Bovine genera with females bearing horns three-fourths are Antelopes, the oldest group in geological time; while *Rangifer*, the single Cervine genus with antlered females, is linked to the elder group of Deer not only by the telemetacarpal manus, but in the form of the vomer posteriorly prolonged by ossification. Interpreted phylogenetically, the embryological facts, adduced by Darwin to confirm his theory of "inheritance as limited by sex," point in the same direction, and favour the belief that the possession of protective weapons by both sexes was a primitive character. Investigation of a number of cases showed that frontal weapons, when present in both sexes, were usually developed at an earlier age than when present in the males only; a crucial instance being afforded by the Reindeer, in which the antlers appear "at a most unusually early age, and at the same time in both sexes." It must be remembered, however, that ancestral Pecora, representing Deer and Antelopes in the Lower Miocene, exhibit no trace of cranial weapons in either sex; and, in the gradual differentiation of genera and species, the tendency to reversion, which is potent even in males, would combine with the maternal function in females to modify their cranial weapons, whether towards inferior calibre, or retrogression, or disappearance, just as we find to occur in fact. For, associated with males which are normally horned or antlered, we have horned and hornless strains of females, not only among genera constituting families, as with *Cervidæ* and *Bovidæ*, but also among species constituting genera, as with the Sheep or the Gazelles, and even among individuals constituting species, as with the Situtunga Antelope (*Tragelaphus Spekii*), the females of which are described as horned by Major Pinto on the upper Chobe, but were found to be hornless by Mr. Selous on the lower reaches of the same river. Among horned females, again, while a majority carry horns which, though well developed, are of generally lesser calibre than those carried by their males, we find, at the two extremes of a graduated series, that some have horns of equal calibre, as in the Hippotragine Antelopes, which show ancestral affinities with the oxen; and that others have horns which are rudimentary or disappearing, as in the Pronghorn, the females of which are usually horned, but occasionally hornless; or in the Blackbuck, the females of which are usually hornless, but occasionally horned.

The comparative proportion of horned and antlered females in their respective families is, however, by far the most striking fact relative to the physiological interference of the maternal function with the development of cranial weapons. Among surviving ruminants with antlers (*Cervidæ*) a single genus represented by a single species exhibits these weapons in both sexes; whereas among surviving ruminants with horns (*Bovidæ*) horned females appear in a majority of genera and in an overwhelming majority of species. Seeking an explanation of these different results in the history of frontal weapons, we find it in the fact that antlers arose from the intermittent fracture and renewal of antecedent structures which otherwise remained permanent as horns. There can be no question that the physiological cost of maintenance in the case of cranial outgrowths which were periodically lost and renewed, must have been immensely greater than in the case of outgrowths which were developed once for all, and permanently retained thereafter. Hence we may conclude that the reserve of vital force necessitated by the complete fulfilment of the maternal function, though generally compatible with the development of horns, was generally incompatible with the development of antlers. The occasional and abnormal presence in female Deer of simple antlers which retain their velvet (the primitive hairy skin), are not shed, and exhibit a rudimentary coronet (the point of primitive fracture) or none at all, appears to be a remarkable reversion to the Miocene ancestry in which similar weapons were aboriginal, permanent, and probably common to both sexes.

The absence of defensive weapons on the maternal side found a certain compensation in greater speed and keener sense of danger, but the solidarity of herding life provided a more effective safeguard in the presence of armed males, who became the chief protection of the herd. The herding Bison was more than a match for the Wolf, and the herding Buffalo for the Tiger; the herding Antelopes could hold their own with the Lion, and will rescue a calf from the armed hunter; and among the herding Deer, when danger threatens, it is the master stags that take the lead. On the other hand, the undoubted maternal gain in the possession of defensive weapons, when present, is proved not only by their long-continued and extensive survival among female ruminants, but more particularly by their marked development in female oxen and in the females of certain Antelopes.

It may be noted, in conclusion, that frontal weapons, considered in respect of sex, present no difficulties to the theory of their protective origin. Their generally inferior calibre and partial absence on the female side admit of explanation as a case of established biological laws relative to growth and reproduction; while their generically superior calibre and normal presence in the males denote a physiological organisation capable of ampler individual expansion, and a protective instinct which put the fighting equipment constantly to the test of battle.

We may therefore conclude, generally, that the horns and antlers of ruminants are the result of a defensive adjustment in biological answer to carnivorous teeth and claws, and consequent upon the relation of destroyer and destroyed which obtained between carnivores and ungulates throughout Tertiary time. They disclose their protective origin and purpose in a structural adaptation which has secured, through natural selection, their relative harmlessness in sexual combat between the individuals of a species and their absolute efficiency against its external foes. Their variable presence or absence, and their variable calibre when present, in the females of genera and species whose males possess them universally, is due to the physiological demands of the maternal function, which were generally compatible with the development of horns, but generally incompatible with the development of antlers. Their historical appearance in the Miocene age of the Tertiary period is contemporaneous with a vast extinction of hornless ungulate families, and their subsequent development in an ascending scale corresponds with the gradual thinning-out of unarmed ungulate genera and the gradually increasing destructive pressure upon those, whether armed or unarmed, that survived. Their evident loss of calibre since palæolithic times may be traced chiefly to the coming of man with missile weapons which, in altering the character of the destroying agency, discounted the value of cranial armature in the struggle for life.

ON THE BEAK OF THE SCOTER.

By J. H. Gurney, F.L.S., F.Z.S.

In the male Scoter, *Oidemia nigra* (Linn.), the black beak with a yellow patch forms a characteristic feature of the genus and a brilliant contrast of colour; but this patch is not always of the same size or extent, nor does it invariably occupy the same position on the upper mandible. This will be seen on reference to the accompanying sketches. Fig. 1 shows the normal appearance of an adult male Scoter, though sometimes the thin line of yellow, which passes over the basal protuberance, does not reach to the forehead. This is its usual appearance in winter, and a bird shot in Caithness in June (now preserved in the Natural History Museum) presents the same appearance, so that the drakes may be presumed to be alike at all times of the year in regard to the colour and shape of the bill. The beak of this bird is correctly delineated in Dresser's 'Birds of Europe,' but Yarrell, Gould, and Macgillivray have either figured it incorrectly, or from abnormal examples. Gould's two plates — in his 'Birds of Europe' and 'Birds of Great Britain'— are as different as possible from one another, and the colour is of too deep an orange for the normal living example. Neither of them, in fact, is satisfactory. My outline, fig. 1, is merely given for comparison with the three which follow, and is that of a drake in winter, in the phase familiar to wildfowl-shooters; but it will be seen how unlike it is to Gould's figure in the 'Birds of Great Britain.'

Figs. 2, 3, and 4 represent abnormal deviations in the distribution and extent of colour in the beak of the male Scoter, and are taken from the heads of three examples shot at Brighton. They have all been mounted by Mr. Pratt, of that place, who ten years ago drew my attention to these variations. No. 2 is still in

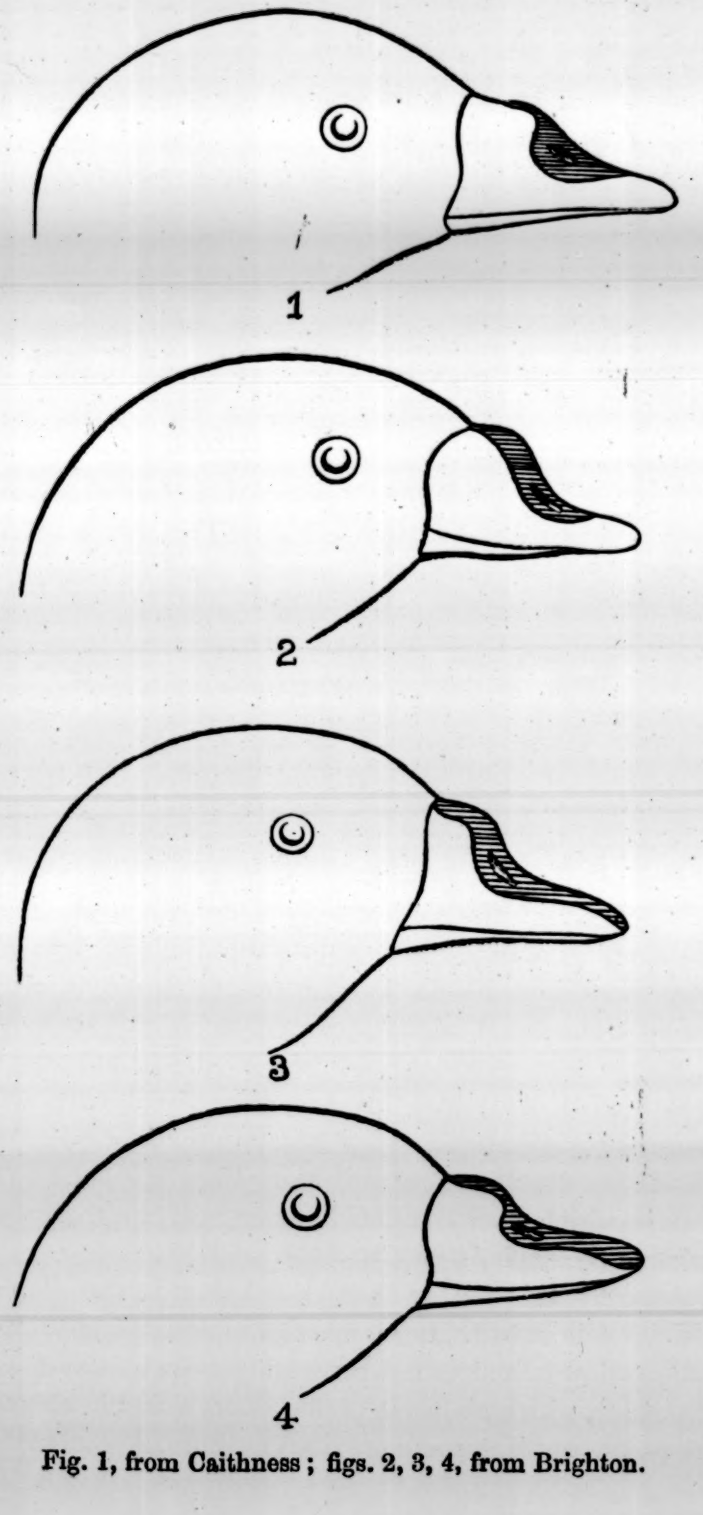

Fig. 1, from Caithness; figs. 2, 3, 4, from Brighton.

his possession, while fig. 3 is in the Booth Museum, in the Dyke Road, and was shot, as I find from the late Mr. Booth's notebooks, to which I have been allowed access, on Jan. 10th, 1881. The yellow is continued to the extremity of the mandible in No. 3, and was so when the bird was shot, any colour afterwards put on being applied in correct imitation of the beak in life: its plumage is a little pied with white feathers on the fore-neck, and this may indicate that the bird was in a morbid state. I presume it to be the second of the five described by Mr. Booth in the third volume of his 'Rough Notes on British Birds,' though the date is not given. There is one in the Norwich Museum with a similarly coloured beak, and the bird figured by Yarrell, which has done duty in four editions of his work, as well as in Mr. Saunders' 'Manual,' is rather like it.

Fig. 4 was shot by Mr. Herbert Langton from the rocks between Brighton and Rottingdean, and is rather like Mr. Booth's, but the yellow extends into a broader band as it nears the nail or tip of the mandible. When first mounted the skin round and above the nostrils, as well as the dividing line on the basal knob, was observed by Mr. Langton to be reddish orange in colour, denoting a vigorous bird, I presume, but the plumage was entirely normal, as usual. Gould may possibly have had before him a Scoter resembling Mr. Langton's; but even then I cannot think it is quite correctly represented, although I am aware of the great pains taken by him in details.

The extent of the yellow colour on the beak of the male Scoter is of more importance than at first sight appears, because the American and North Pacific *O. americana* is only distinguishable from our bird by the amount of yellow on the upper mandible. (See the coloured figure of the head and outlines of beak in 'North American [Water] Birds,' vol. ii. p. 91.) I do not mean to suggest that they are not distinct species, though Mr. Seebohm does not accord it more than subspecific rank; but the way in which closely related forms will approximate is very remarkable (*cf.* 'Ibis,' 1893, p. 346).

Nowhere is this better exemplified than in the *Raptores*, and Ducks may follow suit. In *O. americana*, according to Mr. Trumbull, the yellow colour is not invariably co-extensive ('The Auk,' 1892, p. 154), which shows it is not a very reliable character, and he also points out how some previous authors have misdescribed it.

I do not view the three heads which I have drawn (figs. 2, 3, and 4) in the light of very old birds, but rather as birds of superabundant vigour which have thrown out an excess of yellow colour; as a cock Brambling will occasionally assume a black throat, or a cock Sparrow a chestnut breast, or a Rose Pastor a reddish head. Guillemots and Razorbills have been observed occasionally to have yellow beaks,* which, however, may arise from a deficiency of the normal colouring matter, albeit described as being bright yellow in freshly-killed specimens.

ORNITHOLOGICAL NOTES FROM MID-HANTS.

By Sutton A. Davies.

After I had sent in my notes for 1892 (Zool. Jan. 1893), a Barred Woodpecker, *Dendrocopus minor*, was shot at St. Cross in the last week of December; and in the same week a Great Grey Shrike, *Lanius excubitor*, was shot at Chilbolton, and sent to Mr. Chalkley's to be set up. I saw the bird, which showed the white bar on primaries only, and therefore was probably the *L. major* of Pallas.

January, 1893.

On the 9th, a male Tufted Duck, *Fuligula cristata*, was shot in an osier-spinney at St. Cross, and soon after another came into Mr. Chalkley's hands from Winnall. On the 12th, two Curlews, *Numenius arquata*, were shot at Alresford. The keeper at Fisher's Pond saw a Pochard, *Fuligula ferina*, on the 29th; he also informed me that he had observed two lots of wild geese, *Anser* sp.?, that winter, numbering seven and four respectively, a small flock of Golden Plover, *Charadrius pluvialis*, and a very large wisp of Snipe, from fifty to sixty birds in all. Teal had been scarce on the pond this winter, but Mallard fairly plentiful. One Woodcock only was killed. The Rev. P. H. Owen, of Colden Common, informed me that he had heard the metallic note of the Brambling, and had seen a small flock of Golden Plover passing over. Partridges were paired by the 31st, and at the end of the month Mr. Chalkley received a Pied Woodpecker, *D. major*, from Abbot's Barton, Winchester, and a Barred Woodpecker, *D. minor*, from Ampfield, Romsey.

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* *Cf.* Krüper, 'Naumannia,' 1857, p. 437; Newton, P. Z. S. 1877, p. 2; and Pike, 'Zoologist,' 1877, p. 57.—Ed.

FEBRUARY.

A very wet month. On the 5th a male Common Buzzard, *Buteo vulgaris*, measuring 3 ft. 9½ in. across the wings, and weighing 1 lb. 15 oz., was shot at Easton, near Winchester; the stomach, which I examined, contained the remains of several mice, and nothing else. About the middle of the month the Pied Wagtails, *Motacilla lugubris*, which had left us almost entirely during December and January, began to make their appearance in small parties of six or seven. On the 19th I observed the first twig-bearing Rooks, and on this and the two following days we were visited by immense numbers of Peewits on migration. These birds would suddenly stream down into the water-meadows like a shower of leaves, and seemingly coming from nowhere, for no flocks were visible in the sky. All the while they kept up a low confused chattering like the chorus of roosting Starlings. The 25th was the first date upon which I noticed any signs of the coming brown hood in the "Black"-headed Gulls, *Larus ridibundus*. Grey Wagtails, *M. melanope*, were commoner with us in the winter of 1892–93 than I had ever known them before, and the same thing was noticed at Andover. Last winter, however (Dec. 1893), they were still more numerous.

MARCH.

With March began the phenomenally fine weather which lasted so long in 1893. On the 2nd a Rook's nest was begun in the Warden's Garden at Winchester College, a place where I have never known them nest before; it was followed by a second nest on the 4th, but I regret to say that the birds were shot at and prevented from building. A rookery of eight nests was established this year in "New Field" at Winchester College. On the 11th I saw what was almost certainly a Dipper, *Cinclus aquaticus*, on the river; as two have been shot in Hants within a year, it is not unlikely to have been one. On the 5th we found a Thrush's nest in course of completion, which contained three eggs on the 17th; and on the 16th Mr. R. C. K. Ensor found three nests of this species, each with four eggs. A Herring Gull, *Larus argentatus*, visited us on the 5th, with the Black-headed Gulls, of which we calculated that over fifty per cent. had the brown head in some stage of development. On the 11th I put up three Common Snipe and one Jack; they usually leave us before this date. On the 12th Wheatears arrived on a bare warren some three miles from Winchester—a favourite breeding-place; out of half-a-dozen seen only one was a female. On this date I again observed a female Peewit shaping her nest with a curious upward motion of the breast, as last year (see Zool. Jan. 1893). On the 19th the Chiffchaff arrived, and was singing loudly at 2 p.m. The Rev. P. H. Owen reported its arrival at Colden Common on the 20th. I also saw on the 19th a cock Cirl Bunting, *Emberiza cirlus*, and a small flock of Golden Plover, on migration, near Compton. On the 20th a clutch of Rook's eggs was taken, and I was therefore prepared to find eggs on the 21st, when I inspected a large rookery. One clutch of five eggs was much incubated, but most nests contained from two to three eggs. On the same date we found two Coot's eggs. On the 22nd a pair of Tree Pipits arrived, and I watched the cock singing on the wing for some time; and, in the afternoon, a solitary Sand Martin, *Cotyle riparia*, was hawking up and down the water outside the school bathing-place at Winchester. On this date—an unusually late one with us—I saw the last "winter snipe." On the 23rd I found a Mistle-thrush's nest with three eggs; Mr. C. B. Cobb reported one Wood Pigeon's egg on the 25th; and on the 26th I found the first clutch of Peewits' eggs, considerably incubated. Mr. R. C. K. Ensor heard the Willow Wren at Fisher's Pond on the 28th, but this was a late date, as Mr. E. F. Atkins had observed it at Andover on the 19th. The Rev. P. H. Owen reported the Blackcap from Colden Common on the 29th, and Mr. W. J. Horn, writing to 'The Field,' reported Stone Curlews "in Hampshire" on the 31st. On the 24th Mr. Chalkley received a Pied Woodpecker from Micheldever, a bird included in the schedule of the Wild Birds Protection Act.

APRIL.

I was in Surrey till the 18th, but Mr. Atkins, of Andover, reported the following arrivals:—Cuckoo, 4th; Sedge Warbler, 10th; Swallow, 12th; House Martin, 16th. On the 18th I observed several Stone Curlews near Whitchurch; they were very noisy. On this date the nesting of Wood Pigeons was general; we found several nests with very hard-set eggs. Mr. G. V. Clarke found young Tawny Owls in the New Forest. On the 19th two gulls were still with us, the main body having discontinued their visits. On the 20th Mr. Ensor found a young Wood Pigeon quite fledged, and Mr. Fisher two clutches of Dabchicks' eggs, one considerably incubated, and one of Moorhens' eggs almost hatching. On the 21st Mr. W. H. Turle wrote to say that he had already found eggs of the Stone Curlew in Hampshire. On the 23rd we found the first Wheatear's egg, and Mr. Fisher reported Fieldfares. A nest of the Water Rail, *Rallus aquaticus*, with seven eggs, was found in an osier-bed between Winchester and Twyford on this date. I had previously no record of its breeding nearer than Avington. By the 24th the following species had eggs:—Chaffinch, Greenfinch, Linnet, Wren, Blue Tit, Great Tit, and Pied Wagtail. Mr. Ensor found a clutch of five Reed Bunting's eggs, and heard the Corn Crake. The first Swift, *Cypselus apus*, arrived on this date. On the 25th we heard the Turtle Dove, and found Wheatears nesting in considerable numbers on a large stony warren five miles to the west of Winchester. Stone Curlews were seen in some numbers and were calling continually. On this day we found two nests of the Sky Lark, both with young birds. On the 27th Mr. Chalkley received another Pied Woodpecker from Alton, and a Hawfinch, *Coccothraustes vulgaris*, from Hursley. We found a clutch of Meadow Pipit's eggs, nearly hatching, and Mr. Clarke reported the first Sedge Warbler's eggs. On the 30th I observed some Stone Curlews on a warren to the east of Winchester; they seem to have been numerous this season throughout the county, and Mr. Turle (*in litt.* Dec. 13th) says, "seen in great numbers this autumn. Previous to the 30th Mr. Turle had found eggs of the Barn Owl and Bullfinch. The Long-eared Owls, *Asio otus*, again built this year in a wood not two miles from Winchester, and the nest, with two full-grown young ones and two smaller birds, was found on this date.

MAY.

On the 1st we found two nests of the Snipe, *Gallinago cœlestis*, near Stockbridge, one containing one egg and the other four eggs, very "hard-set." Linnets had young ones ready to fly, Peewits young, and Yellowhammers eggs. Mr. Turle found three nests of the Long-eared Owl near Whitchurch, one with young almost ready to fly, one with six eggs, and one with five eggs. Mr. B. C. Cobb found young Barn Owls, two nests of the Great Tit, and one nest of five Jay's eggs, incubated, in the New Forest. Mr. G. V. Clarke found a clutch of Marsh Tit's eggs, much incubated. Eggs of the Creeper and Willow Wren were found at Basingstoke on this date by Mr. A. S. Bates. On May 2nd, Mr. Turle found three Snipe's nests, each with four eggs; and Mr. R. C. K. Ensor, a Whitethroat's nest, with five eggs. On the 3rd, I saw the first Spotted Flycatcher, *Muscicapa grisola.* On the 5th, Mr. Turle found eggs of the Sparrowhawk; and on the 7th, a Wood Lark's nest, with five eggs, in the New Forest. On the 6th, Mr. G. B. Cobb found young Yellowhammers; and a Nightingale's nest was found, in one of the few spots in the immediate neighbourhood where this bird builds, with three eggs. On the 9th, I found a very-loosely constructed Song Thrush's nest, with no lining of mud. Mr. Cobb had found a similar nest on the 8th; and a correspondent of 'The Standard,' writing from Alresford on April 3rd, remarked that the same was the case in that place, the extreme drought having prevented the birds from obtaining the necessary materials. On the 10th, I found young Coal Tits. Reed Warblers had begun to build on the 11th, and the first egg was reported on the 19th. Mr. Stares found Nightjar's eggs on the 15th. On the 11th, we found a nest containing six eggs of the Tree Pipit; and on the 13th, two eggs of the Turtle Dove were reported. On the 22nd, a nest containing young and eggs of the Long-eared Owl was found in a wood four miles to the west of Winchester, where, as I had long suspected, this species breeds. On the 11th, I saw a solitary "Black"-headed Gull playing with some rooks in the wind above Owslebury Down. On the 23rd, I observed the first Wood Wren, *Phylloscopus sibilatrix,* I have ever seen in this district, near Fisher's Pond; on this date I found eggs of the Swift and Flycatcher. On the 25th, Mr. John Stares, of Porchester, saw a Spoonbill, *Platalea leucorodia,* as recorded in 'The Zoologist,' 1893, p. 268. Mr. Ensor found a Cuckoo's egg in a Reed Warbler's nest on the 24th. The above detailed, and, I am afraid, somewhat tedious list of dates, I have copied out to show what a great difference a dry season like that of March, April, and May, 1893, makes to the times of nesting.

JUNE.

Sand Martins were unusually late in nesting with us in 1893, and it was not till the 1st that their nesting became general. Mr. Ensor observed a second Wood Wren at Hursley on the 15th. On the 26th, Mr. Stares found young Redshanks in the down in some marshes not far from Fareham. Turtle Doves nested with us in great numbers this month. On the 20th, I went down to Lyndhurst, and was greatly struck by the large number of Whinchats about.

JULY.

On the 6th, a solitary Herring Gull flew over Winchester College, at 6.45 p.m. The Hon. A. H. Baring informs me that no Tufted Duck's nest was found at Alresford this year, although the birds were occasionally seen about. This species, however, has bred this year in South Hants, for Mr. Stares saw a female and a young one in the neighbourhood of Fareham on August 7th; they are known as "Norwegian Ducks" in that locality. The Sheld Duck, *Tadorna cornuta*, nested in South Hants this year; Mr. Stares saw the birds about continually, and told me he thought they had nested. It afterwards transpired that a labouring man had tracked the old duck to her nest in the burrow and eaten the eggs! I forbear to mention the exact locality, as they may nest again there. Mr. E. F. Atkins saw a Pied Woodpecker near Charlton this month. He also informs me that a pair of Grey Wagtails, *Motacilla sulphurea*, frequented the neighbourhood all the summer, and during the summer of 1892. It would appear that they bred there.

AUGUST.

On the 1st, Mr. Stares saw two Greenshanks near Porchester. On the 10th, Mr. Chalkley received a Hen Harrier, *Circus cyaneus*, from Basingstoke. On the 15th, Mr. Stares saw some Pigmy Curlew, *Tringa subarquata;* and a Red-necked Grebe, *Podiceps griseigena*, was shot in Portsmouth Harbour about this date. The last Swift at Andover was seen by Mr. E. F. Atkins on the 10th.

SEPTEMBER.

On the 5th, Mr. E. F. Atkins saw the last Cuckoo at Andover. On the 6th, Mr. John Stares, of Porchester, saw an Osprey on the shores of Portsmouth Harbour. On the 11th, a Herring Gull was shot at Crawley, and forwarded to Mr. Chalkley; and on the 13th, he received a Dipper, *Cinclus aquaticus*, which had been shot on Chilbolton Down. It will be remembered that a bird of this species was shot at St. Cross, Winchester, on Nov. 28th, 1892. On the 19th, I went down to Porchester, where I saw some Curlews, Redshanks, and numerous Dunlin and Ringed Plover. On the 20th, Mr. Stares saw four Greenshanks near Porchester. I returned to Winchester on the 20th, and found the place swarming with Pied Wagtails, mostly immature birds. Mr. Thomas Groome, of Stockbridge, writing to 'The Field,' says: "A couple of Quail were killed by Mr. T. Cannon and his party on Sept. 11th, in the parish of Nether Wallop, Hants. Not far from the spot where they were killed, I flushed another on Oct. 7th. Nearly every summer in this neighbourhood, when the corn is standing, I hear their call, but seldom find them in the shooting season." Mr. W. H. Turle informs me that twenty-three Quails were shot about Newton Stacey in September, "far more than we have ever had before." Mr. E. F. Atkins told me that they had no doubt bred this year near Andover, for he had frequently heard and seen them at a place some two miles from that town. Curiously enough, Mr. Stares had seen no Quails this year at Porchester, where, generally, some occur every autumn. Corncrakes were also scarce here this autumn, whereas forty-seven were shot at Newton Stacey in September (W. H. Turle, *in litt.*); and I was informed that a large number were shot about Abbot's Barton. The Hon. A. H. Baring informed me that a Quail's nest was found at Itchen Stoke, as in 1892. On the 29th, I went down to the New Forest, where I observed several Ring Ousels, *Turdus torquatus*, on migration; Mr. G. V. Clarke informed me that he had seen numbers of Whinchats, *Pratincola rubetra*, evidently on migration. The first appearance of the Gulls on their daily visits was on the 23rd.

OCTOBER.

On the 10th Mr. Stares saw a flock of Tree Sparrows, *Passer montanus*, on Titchfield Common. A good many Goldfinches about on the downs this month. Mr. Ensor, on the 18th, saw five Stone Curlews, *Œdicnemus scolopax*, on one of the warrens where they breed in the summer, some five miles from Winchester. On the

23rd Mr. Stares reported the first Hooded Crows, near Fareham. On the 28th I went down to the coast near Lee-on-the-Solent. Hoodies were numerous, and we saw a few Dunlins and Redshanks, large numbers of Ducks, and one lot of seven Brent Geese. On this date Mr. Stares saw the first Fieldfare at Titchfield; and he informs me that a large migration of Goldcrests took place on the 30th, the gardens at Porchester swarming with them. In the second week of this month two Sandwich Terns, *Sterna cantiaca*, were shot in Langston Harbour, just on the borders; and in the beginning a Grey Phalarope, *Phalaropus fulicarius*, was shot near Winchester; special circumstances prevent me from giving details more precise. On the 31st I saw the first Fieldfares, at Winchester. Mr. Stares saw a Merlin near Porchester in the course of the month.

NOVEMBER.

On the 1st Mr. Ensor saw numbers of House Martins and Sand Martins near St. Cross. On this date I went down to Porchester, where I saw the first Jack Snipe of the year. Mr. G. B. Cobb and Mr. Stares saw a single Snow Bunting, *Plectrophanes nivalis*, but I was not with them at the time. Mr. Stares gave me a live Guillemot, a young bird of the year, which had been caught on a line by a man fishing in the Solent; I kept it for a day or two, and then gave it to the "Abbey Gardens," Winchester, whence it unfortunately disappeared a few days afterwards. On the 7th Mr. Ensor saw the first "winter Snipe." On the 9th Mr. Stares sent me a young male Scaup Duck, shot at Hill Head, on the Solent, on the 8th. On the 11th a Bittern was shot at Worthy, and sent for preservation to Mr. Chalkley, who had also received a Spotted Crake, *Porzana maruetta*, shot at St. Cross on the 1st. Mr. Stares saw a Great Crested Grebe in the Solent on the 8th (*in litt.* Nov. 11th). Goldfinches were unusually plentiful with us this winter, and Grey Wagtails more numerous than I have ever known them before. On the 21st we saw a female Teal on the Itchen; we very rarely see this species near Winchester. Mr. Stares tells me that he saw two Woodcocks near Fareham on the 10th; a flock of Brent Geese, five Sheldrakes, and a Great Northern Diver, in the Solent, on the 11th; and a Bittern, near Titchfield, on the 28th. The Hon. A. H. Baring informs me that a male Shoveller appeared on the lake at

Alresford Grange after one of the big gales in this month. Mr. E. Sillence, writing to the 'Hampshire Independent,' reported seeing a Swallow (*Hirundo* sp. ?), flying round Romsey station on the 14th.

DECEMBER.

On the 2nd Mr. Stares sent me a Razorbill, immature, from Porchester. On the 12th I saw the eggs of a Great Tit, which nested in a hole of a wall at St. Cross, but deserted on this date, owing, I suppose, to the sharp frost of the night before. Mr. Turle (*in litt.* Dec. 14th) says, "There is a Harrier flying about our place (Newton Stacey), but I have asked for it not to be shot."

NOTES AND QUERIES.

MAMMALIA.

Mammals of Cheshire.—For some time I have been collecting evidence of the occurrence and distribution of the Cheshire Mammalia, with a view to the compilation of as complete a list as possible, and now write to ask for the assistance of any readers of 'The Zoologist' resident in the county. Information is particularly desired about the Polecat, Marten, Badger, Lesser Shrew, Black Rat, Harvest Mouse, Dormouse, all the Bats, and the Seals and Cetaceans of the Dee and Mersey estuaries. The presence in any district of the various Voles, Mice, and Shrews may often be detected by an examination of the embedded skulls in the pellets of the Barn Owl, and if anyone is sufficiently interested in the matter to forward a supply of these pellets, either to me, or to Mr. J. A. Coward, of Higher Downs, Bowdon, who is co-operating with me, the help will be promptly and gratefully acknowledged. During the next few months many opportunities of obtaining Bats will doubtless occur, and we shall be glad to identify and, if desired, return any specimens which may be forwarded to us.—CHAS. OLDHAM (Brookside, Sale, Cheshire).

Polecat in Cambridgeshire.—Mr. Griffin, birdstuffer, at Cambridge, has a very nice female Polecat, *Mustela putorius*, which he tells me was killed at Swavesey, in the summer of 1892.—G. E. H. BARRETT-HAMILTON.

Bank Vole in Warwickshire and Worcestershire. — Until I read Mr. Elliott's note (p. 223), I had overlooked the fact that this species had not previously been recorded for Worcestershire. In May last I was at a bank situated so close to the boundary line between Warwickshire and Worcestershire that, for natural history purposes, it might be claimed by either county. Bank Voles were numerous, and I watched their movements for some time. I killed one, and found that it was feeding upon the tender young leaves of the hawthorn. It would dart out, seize a leaf, and retire to devour it. I know several places in Worcestershire where this little animal is common, and I have one now in my possession, which, after a severe thunder-storm, was washed into the middle of King's Road, King's Heath.—F. Coburn (Holloway Head, Birmingham).

BIRDS.

Reported Nesting of Marsh Harrier near Oxford.—With reference to the notes on this subject which have already appeared (pp. 227, 268), we are in a position to state that having made further enquiry of Mr. Swann and Mr. Buttress, we are satisfied that some mistake has been made, and that there is no evidence to support the statement that the Marsh Harrier nested in Oxfordshire in July, 1890.—Ed.

Nesting of the Grey Wagtail.—During the last week of March last, when staying at Nettlecombe, a village a few miles from Williton, I saw a pair of Grey Wagtails (*Motacilla sulphurea*) running about the drive and lawn in front of the rectory, and perching on the trees and roof of the house, apparently looking out for a nesting site. On mentioning the fact to my host, he informed me that a pair (of what he called Yellow Wagtails) nested every year in the ivy or creepers on the house. The rectory is some 200 or 300 yards away from any water. I saw the pair every day while I was there, and they remained the greater part of the day about the house. I was surprised at this, for I have seldom seen them far from water for any length of time, and on referring to Seebohm's 'British Birds' (vol. ii. p. 204) I found no mention of them in such a situation.—H. St. B. Goldsmith (Bridgewater).

Nesting of the Lesser Redpoll and Hawfinch in Somerset. — Since writing to you about the Lesser Redpoll (p. 265), I have heard of several instances of its nesting in Somerset, and of some two or three nests being taken this year in the county. The Hawfinch (*Coccothraustes vulgaris*) has also nested in considerable numbers in the north-eastern parts of the county this summer.—H. St. B. Goldsmith (Bridgewater).

Nesting of the Marsh Warbler near Bath.—In June, 1892, I first made the acquaintance of the Marsh Warbler (*Acrocephalus palustris*) in Oxfordshire, where I was shown it by Mr. Warde Fowler; and in July, 1893, in company with Mr. Fowler, I both saw and heard several of these birds in Switzerland, and found one nest (*cf.* Zool. 1893, p. 308). This year I have found a pair of Marsh Warblers and their nest near Bath. The nest which was found on June 19th in an osier-bed contained two typical eggs, and was suspended from stalks of meadow-sweet, and one osier-stem. It was about 18 in. from the ground, and I have especially noticed in this case, what has already been pointed out by Mr. Fowler, that the stems passed outside the nest and through the rim only, whereas in nests of the Reed Warbler the stems which support them are usually worked into the sides of the nest from near the bottom to the top. There was a little horsehair lining, and some pieces of wool were worked into the foundation outside. The hen bird began to sit on four eggs on June 22nd; I took one egg, and the remaining three were hatched on July 5th. The cock bird was a splendid mimic, and it was most amusing on two occasions when I took two friends, who know the Reed and Sedge Warblers well, to listen to him. Among others he imitated especially well the Thrush, Sky Lark, Great Tit, Whitethroat (both its song and alarm note), Swallow, Willow Wren (song and alarm note), and Whinchat. On the same day on which I found this nest I also found nests of the Reed and Sedge Warblers near the same spot, and so had a good opportunity of comparing both birds and nests of the three species.—H. C. PLAYNE (Clifton College).

Sand Martins nesting in a Ruin.—During the last week of June, while visiting Garrison Island, on Lough Cullen, Co. Mayo, I was surprised to see a number of Sand Martins flying about the castle walls, and passing in and out of the crevices between the stones where the mortar had fallen out. On landing to examine the place I saw traces of nests in the crevices, and with a stick pulled out part of one; but the fissures were so deep, and the mortar so hard from age, that it was impossible to get at either eggs or young birds. The ruins are those of a circular-shaped castle, or tower, probably the former, for the diameter of the circle enclosed by the walls is eighteen or twenty yards; the portions of the walls standing are about twelve or fifteen feet in height, almost level with the inside, which is filled up with fallen stones and rubbish, overgrown with grass and nettles. At the base of the walls outside, in a thicket of tall nettles, a Red-breasted Merganser (*Mergus serrator*) was sitting on ten eggs; and inside, in some long grass and nettles, was another nest of this species with a similar number of eggs, on which the duck was sitting so close that she was almost taken with the hand before leaving the nest. On the broad, flat, grassy top of the walls three pairs of Common Terns had eggs, and four or five pairs of Black-headed Gulls; while in the centre, on the grassy rubbish were the nests and eggs (one with young just hatched) of five or six pairs of Terns. At the bushy end of the island two pairs of Sandpipers (*Totanus hypoleucus*) were noisily flitting about, evidently showing by their anxiety that they had eggs or newly-hatched young close by. — ROBERT WARREN (Moyview, Ballina).

Lesser Redpoll breeding in Somersetshire.—It may be worth mentioning that there are a good many of these birds this year on Clifton

Downs, only separated from Somersetshire by the river, and nests have been found. I have seen the birds on the Somersetshire side of the river, but have not seen a nest, though I have no doubt they breed there also.—Herbert C. Playne (Clifton College).

Redstart breeding in Co. Tyrone.—On June 16th I visited Baron's Court Demesne, Co. Tyrone, which abounds in old timber. On enquiring of Mr. James Maclean what birds bred there, he showed me a pair of Redstarts which he said had bred three years in succession since he came to the place. They had their nest in a hole in a birch tree. It contained four young, ready to fly, and some eggs that had not hatched out. Having seen Redstarts in Norfolk last May, I had no difficulty in identifying them. On the 26th and 29th May, 1888, the Rev. G. W. Peacocke saw and heard a male Redstart singing in Rash Wood, also in Co. Tyrone, not very far from Baron's Court. Hitherto the Redstart has been recorded to breed in Ireland only at Powerscourt, Co. Wicklow, since 1885. Elsewhere in Ireland it has only been known as a very rare visitor, and supposed to be much rarer than the Black Redstart, which probably visits our coasts every winter.—R. J. Ussher (Cappagh, Co. Waterford).

Cuckoo calling on the Wing.—I have on several occasions heard the Cuckoo calling on the wing, but always (I think) when pursuing another Cuckoo, presumably the female. On May 22nd, 1893, at Winchelsea, I watched one Cuckoo chasing another for about an hour, and had a particularly good opportunity of listening to the birds; for, after flying round the neighbouring fields, they frequently settled on the tree under which I was basking. The bubbling note of the female and the call of the male were kept up almost continually both when the birds were on the wing and when settled. I did not hear the female utter the syllables *Cuc-koo*, though I am by no means certain that she does not sometimes do so.—A. Holte Macpherson (51, Gloucester Terrace, Hyde Park).

In the last number of the 'Zoologist' I note the enquiry (p. 264) whether it is a common occurrence for Cuckoos to call while on the wing. This same question has already been asked me this year, so I have kept an especial look-out, and in May watched a Cuckoo fly for some distance over the Avon, calling all the time. This is the only instance which I have noticed personally, but a friend of mine also observed a Cuckoo calling while on the wing, near the same place, on another day.—Herbert C. Playne (Clifton College).

I have a note that on May 14th, 1893, I saw a Cuckoo, which was uttering its cry as it flew past me. There was a pair of them flying together, slowly, but one only was calling. I have a distinct recollection of the circumstance, but although this is the only case I have noted I am sure I have heard the Cuckoo calling on the wing on several occasions of which I have kept no record. My observations were made in the south of the stewartry of Kirkcudbright. The Cuckoo arrived there in 1893, on April 23rd, about the normal time, or perhaps a day or two earlier than usual.—J. W. Payne (Edinburgh).

Referring to the enquiry on this subject (p. 264), I do not think it can be a common occurrence for a Cuckoo to call while on the wing. Living on a Highland hill-side, which happens to be a favoured haunt of Cuckoos. I have had considerable opportunities for observing their habits at pretty close quarters, and in my experience Cuckoos invariably call when perching, the act of calling being accompanied with considerable dilatation of the throat, and an apparent muscular effort, which seems to make the perch a desirable *point d'appui*. Calling Cuckoos constantly fly for a short distance, and will re-commence calling the instant after alighting, but never, to my knowledge, during flight; although they will sometimes, when apparently disturbed, fly off, uttering a low and rapid "kok-kok-kok-kok," quite distinct from the "water-bubbling" note, which I have also heard, and which Mr. Howard Saunders ('Manual,' 278) ascribes to the female.—Allan Gordon Cameron (Ledaig, N.B.).

My own observations lead me to think that it is most decidedly an unusual occurrence; but that Cuckoos do call at times when flying I had positive ocular proof last year in the Broad District of Norfolk. The swampy grounds surrounding many of the broads seem to be a perfect paradise for Cuckoos, judging by the number that congregate there, and dozens of them could be seen and heard in an hour's tramp over the marsh. On May 2nd, 1893, I was out a little after daylight, and saw as usual great numbers of Cuckoos perched on the stunted alders scattered all over these wet marshes, most of them calling vociferously, each apparently trying to outcall the other. And one of these birds was so engaged in its vocal exercise that it allowed me to get within a few yards of it. When at last it saw me, it slipped hurriedly off the bough on which it was sitting and flew off towards the "broad," emitting at least one perfect call as it went, and while still quite close to me. This is the only instance which I can personally adduce of a Cuckoo calling on the wing.—F. Menteith Ogilvie (Sizewell House, Leiston, Suffolk).

According to my experience, it is a common occurrence for the Cuckoo to call while on the wing. The following are extracts from my note-book of this year:—April 21st. Saw two Cuckoos mating this morning. The usual performance: she flying away, he persistently following her, and crying "cuckoo" continually in deep and beautiful tones. My sudden appearance caused him to swerve away; she stopped in her flight, alighted on a tree, and looked for his coming. When he approached with his mellow "cuckoo," she launched into the air and again lured him on. May 11th. *Cuculus canorus* flew across my garden this morning, calling loudly as he flew. May 18th. Two Cuckoos flying across King's Road, the female first, the male following, calling "cuckoo." May 21st. Saw the two Cuckoos again this morning, and have now seen them many times. The female always goes first, silent; the male follows in her wake, crying "cuckoo." They are high in the air when they pass over.—F. COBURN (Holloway Head, Birmingham).

I have heard the Cuckoo calling while on the wing, but so far as my observation goes, I should say that such a thing is unusual.—WILLIAM W. FLEMYNG (Coolfin, Portlaw, Co. Waterford).

[We have received several other communications on this subject, for which unfortunately we are unable to find room this month.—ED.]

Cormorant choked by a Flounder.—Seeing the account of a Great Northern Diver having been choked by Grey Gurnard (p. 265), brings to my recollection an instance of a Cormorant having been choked by a Flounder. I was returning from Bartragh in my gunning punt, when I saw a Cormorant lying flat on the water, with outspread wings, and this unusual position attracting my attention, I rowed towards the bird and picked it up, when I found a Flounder 8 in. in length partly swallowed, and firmly embedded in its throat. The Cormorant had swallowed the head and body of the fish as far as the anal fin, and the little sharp spine in front of it got stuck firmly inside the throat. As the unfortunate bird could neither swallow nor disgorge the fish, it was probably drowned when unable through weakness and exhaustion to keep its head above water.—ROBERT WARREN (Moyview, Ballina, Co. Mayo).

A Visit to Puffin Island, Co. Kerry.—On June 5th I visited this island, near Portmagee, Co. Kerry. A notice of the ornithology of the island may be found in an article by my friend Mr. Ussher (Zool. 1884, p. 481). The Rev. A. Delap, Rector of Valentia, who was one of our party, found a piece of composite candle on the west side of the island, where a good many pairs of Herring and Lesser Black-backed Gulls were congregated breeding, and where we saw a pair of Greater Black-backs. This piece of candle I have sent to the Editor. It was no doubt swallowed by one of the species of Gulls which were seen around the spot, and what could not be digested was cast up in the form found. Mr. Delap told me that he often found pieces of candle on the coast at Temple Crove, Co. Donegal, where he was parish clergyman before he came to Valentia. These pieces, he says, were evidently thrown out by stewards on passing steamers, and, when cast up on shore, were eaten by Gulls! This fact may be worth recording, if only to show the greediness of these birds, and how nothing comes amiss to them. I was anxious to inspect the colonies of Terns mentioned by Mr. Ussher, but not a single bird was to be seen. They had not arrived for breeding. Nor was I able to get eggs of either Shearwater or Storm Petrel, although the boatmen who accompanied us got several eggs of Puffins. We landed on the rocky islet near Puffin Island in hopes of finding a nest of the Great Black-back. No eggs, however, were to be found. We got two eggs, in separate nests, of Herring, or Lesser Black-backed Gulls; which species it was impossible to say, as we did not see the birds on their nests. The weather, I am sorry to say, was too unpropitious to allow a visit to be paid to the Skelligs.—WILLIAM W. FLEMYNG (Coolfin, Portlaw, Co. Waterford).

[The piece of candle forwarded by our correspondent is of the size, shape, and general appearance of a "blanched almond."—ED.]

Eggs of the Tree Sparrow.—I can quite confirm Mr. Aplin's remarks (p. 228) concerning the eggs of this bird. I have met with this locally-breeding species somewhat commonly in three different vicinities, namely, the sea-shore, in a spot near Ramsgate, where it breeds indiscriminately in holes of trees or crevices and holes in the sandstone cliff; near Ilford, in Essex; and in the neighbourhood of Harrow, Middlesex, where it is, I believe, as common as in any other locality in the British Islands. In this latter district I have observed its habits for the past six or seven years, and during that period I have seen a very large number of nests, once as many as *three* in a single old oak tree. I take the perfect clutch of eggs to be five in number, and out of all the sets I have seen I never saw one of that number which had not one "light" egg, with but few and pale markings. Certainly some sets of four have had all the eggs dark, but even in a few sets of that number I have had a light egg. One peculiarity in this species is its habit of using the same nesting-hole year after year, in spite of molestation. I know of one such hole in the vicinity of Harrow which is used each season, first by a pair of Starlings, and later by the Tree Sparrows, which will persist in their attempts to rear a brood in it, although, from its exposed position, the nest has been robbed perhaps twice or thrice in a season.—HENRY K. SWANN (Forest Grove, Colville Street, Nottingham).

Curious proximity of Nests.—We have in the garden plantation here two nests in such close proximity that I think it worth recording in 'The Zoologist.' They are those of a Wren and a Tree Creeper, and are built in an old stump which is hollow and split. The Wren's nest is at the top, and only six inches from that of the Creeper. In the deer-shed in the paddock here I have also a Thrush's nest with young, and a Wren's nest at the side of it, the one actually touching the other.—J. WHITAKER (Rainworth, Notts).

Ornithological Notes from France.—During the spring of this year I spent twelve days with a friend in France, with the intention of seeing what I could of birds, and especially anything connected with their migration, and with the help of bicycles we travelled over a good deal of country.

Starting from St. Malo, on April 14th, we passed through Dinan and Vannes, and reached Nantes on April 16th. Though the country abounded with birds, especially Whitethroats, Yellow Buntings, Cirl Buntings, Tree Pipits, Redstarts, and Magpies, we saw nothing of particular interest till we were near Vannes. Here we first came upon a colony of Sedge Warblers singing in some thick bushes, and amongst the gorse on some moorland a few miles further we heard Grasshopper Warblers, while in the same neighbourhood we saw Hen Harriers. We were just five miles from Nantes when suddenly several Nightingales in a thick hedgerow burst forth into song. From this point we seemed to be always close to a Nightingale, and they were so numerous that I cannot help believing that we had suddenly met the "rush" of Nightingales migrating northwards; the hedges and thickets resounded with their songs. The same evening it was pleasant to see Swifts careering through the air over Nantes, and to hear their screaming some days earlier than usual. We reached Les Sables d'Olonne, our next stopping place, after a stormy day's ride, on April 17th, and early on the following morning I walked out on the sand-hills by the sea, and saw parties of Swifts flying steadily northwards. From Les Sables our day's journey was to Luçon, and on the way, at Avrillé, in some trees by the roadside, I found a small colony of Bonelli's Warblers. How glad I was to meet again this delightful little bird, and to be reminded of the slopes of the Alps, where I first made its acquaintance last summer. On this day also I met with the Crested Lark, and afterwards found it fairly abundant in many places. The first part of the road from Luçon to La Rochelle passes over a large tract of flat country intersected by many ditches, where there are few bushes and trees, except by the roadside. Here there were numbers of Stonechats, Yellow Wagtails, Corn Buntings, Sedge Warblers, and a few Whinchats and Wheatears. In the trees by the side of the road were many Magpies' nests, some of them destitute of any roof. The Magpies are so numerous, and apparently unmolested, that they seem to have grown careless in building their nests. They were to be seen sitting on their eggs in most exposed situations quite near the ground. Near La Rochelle Wrynecks were most extraordinarily abundant, and were often seen as well as heard on the trees by the road. One pair sat side by side on a gate-post, calling in unison, and did not seem to mind my presence in the least. From the midst of a thick osier-bed I had splendid views of three Hen Harriers, two males and one female, which kept flying close to my head, and the latter once perched on an osier-stump only a few yards from me. In the evening of April 19th we reached Rochefort, and next day rode on through some beautiful country to Blaye, on the bank of the Gironde. On the way Hoopoes soon attracted my attention, and it was delightful to watch them bowing as they uttered their well-known "hoop-hoop, hoop-hoop." On the same day (April 20th), near Pons, I first saw a

Woodchat Shrike; nearer Bordeaux I saw two more, one of them singing from the top of a vine-pole. In a reed-bed not far from Blaye were two Great Reed Warblers, singing so loudly that I heard them some distance away; they were not at all shy, and one perched in full view on a reed close to me, as though pleased to have a listener. At Bordeaux we only made a short stay, and I was unable to find any new birds; Nightingales were very plentiful, but Chiffchaffs and Willow Wrens were not so numerous as they were further north. In the evening of April 21st, while riding along the bank of the Garonne, I noticed a very large number of Swallows flying steadily down stream quite close to the water; there was a continuous flight of them till it became too dark to see. Could they have been migrants that had crossed the Cevennes, or were they only making for some favourite roosting-place down the river? We travelled by train to Saumur, and rode back to St. Malo through Rennes. On the sand-banks in the Loire I saw Waders, which I believe were Dunlin, and near Angers heard the only Landrail we met with. On our return we found Nightingales plentiful near St. Malo, though none were there when we started. What especially surprised me was that I could find no Wood Wrens in any part of France we visited, though I searched for them in many suitable spots; there were plenty to be found as soon as we had crossed again to Southampton. Nor did I see any Flycatcher or Red-backed Shrike; I suppose it was too early for their arrival, even so far south as Bordeaux. In all I made a list of seventy-three species, which I was able to identify, and it might perhaps have been increased if a good deal of valuable time had not been wasted in taking shelter from the heavy storms which we encountered almost every day.—H. C. PLAYNE (Clifton College).

Nesting of the Bittern in Hants.—The Rev. A. A. Headley has lately shown me an egg which is undoubtedly that of a Bittern, *Botaurus stellaris*. He obtained it of a working man in Alresford, who stated that it was taken in Avington Park, some six or seven years ago, and that the nest was built in the stump of a withy, and made "like a Jack Hern's." If the record can be considered indisputable, it is a remarkable one. The Rector of Alresford will, I have no doubt, be glad to submit the egg for inspection, though it is, unfortunately, in a bad state of preservation.—SUTTON A. DAVIES (Winchester College).

CHELONIANS.

Emys lutaria turned out in Suffolk.—In May, 1889, we placed eleven Tortoises of this species in a pond situated in a plantation in this parish (Leiston), where for a time they throve, and seemed likely to remain. But before long they began to wander in various directions. The pond is stocked with tadpoles, various aquatic insects and their larvæ, but is much shaded by trees; and possibly this lack of sunshine may have been the cause of their leaving the place in search of some more congenial abode. In the beginning of June in that year a Tortoise with a marked carapace was twice found some distance away in a road, and in each case replaced in the pond. On Nov. 25th, 1890, one was picked up in the village by a boy and brought to me. It was apparently in good plight, and felt very heavy, notwithstanding it had passed the winter at large. Another was found in the summer of 1891, and I was told that during that of 1893 a boy picked one up, but I did not see it. On Feb. 10th of the present year (1894) some men ditching in the meadows, rather less than a quarter-of-a-mile from the pond, threw out with the mud two Tortoises. They placed one of them on the meadow, at some distance from the ditch, and went on with their work, but it soon made its way back to the water, and I afterwards saw its tracks across the wet mud. They said that they had also found one on the "wall delf," at a spot several hundred yards further from the pond, when at work there shortly before Christmas; and that, about three years before, they threw one out of a ditch which is over a quarter-of-a-mile from their old quarters, and in the opposite direction. On April 8th last a boy brought to the house a fine healthy specimen, which he had found basking on a piece of wood by the river Alde, about half-a-mile off. It felt heavy, and had a very perfect and handsome shell, the markings being particularly bright, clear and distinct, as if surrounding conditions had been favourable to its well being. Yet another was brought to me on April 16th, which had been taken from a ditch near Iken Cliff, between two and three miles from the pond from which it had wandered Since these specimens were placed in the pond in May, 1889, no others have been turned out here, and it is very unlikely that anyone else in the neighbourhood can have liberated any; therefore four at least out of the original eleven must have survived five English winters. On fine bright days, while in the pond, several of these Water-tortoises would often clamber upon a floating log in the sunniest part of the water, and there remain basking in the warm rays; but so alert and quick were they to perceive any threatening danger, that if anyone approached at all near to them, however noiselessly, they would drop off one by one into the water like stones. Those in the ditches are fond of lying, in hot weather, upon the "scum" on the surface of the water, with the head raised high in the air, so as to get as good a view as possible of their surroundings, in order, perhaps, to guard against a surprise. Sometimes the brightly-spotted head and wide-awake-looking eye is all that can be seen above the surface- Up to the present time I have not seen or heard of any young Tortoises, and should be very glad to know of any instance of the breeding of *Emys lutaria* in this country. Since writing the above we have turned out a few more.—G. T. Rope (Blaxhall, Suffolk).

REPTILIA.

The Poison of Australian Snakes.—Amidst all that has been written about the poison of Australian snakes, very little indeed—in fact, only a few stray remarks here and there—is concerned with its chemistry. As Messrs. Martin and Smith, who are engaged in a systematic investigation of the subject in Sydney, say, a complete investigation into the subject of snake-poison must answer three questions:—1. What is the poison? 2. What is its exact physiological action? 3. How can we best prevent or counteract its action? The great majority of workers have tried to answer the third question first, and whilst it is of course possible, though it has not been done yet, that one might by accident stumble across an "antidote" to snake poison, still it stands to reason that the rational way to begin is to try and answer the first two questions, and having got our answers to these, we may then perhaps hope to scientifically deal with and answer the third. There is the initial difficulty in the Australian snakes, of obtaining a large quantity of poison, because a Black Snake, for example, only puts out at one time perhaps a tenth as much as a fair-sized Cobra or a Rattlesnake does. What it does put out is, however, sufficiently virulent in nature, for, after drying the venom, it is found that the injection of 1–1000th grain is sufficient to kill a rabbit weighing five pounds in a hundred seconds. Messrs. Martin and Smith point out that the amount of solid matter obtained by drying the liquid venom varies considerably under different circumstances, such as previous discharge of poison, feeding, time of year, &c.; and as the venomous property depends on this solid matter, the virulence of equal quantities of wet snake-poison varies considerably. In other words, it is quite possible that the bite of the same snake might at one time contain enough poison to be fatal and at another time be much less potent, even though the actual amount of fluid injected on each occasion might be the same. They naturally point out that this is an important element to be taken into account in all experiments when the fluid is injected into an animal to ascertain its effects, and that its not being taken into account unfortunately vitiates all the experiments of the committee appointed by the Medical Society of Victoria in 1875–6. Following the experiments of previous workers, it was easily found that, by adding alcohol to the venom, the latter could be divided into two parts, a whitish flocculent substance which is thrown down, and a fluid. The next step in the enquiry is a very evident one, namely, to find out if one or both of these elements contains the poisonous matter. Supposing now that we take three different substances—1, snake-poison as put out from the snake's fang; 2, the white flocculent matter which is thrown down when absolute alcohol is added to the poison; 3, the fluid which remains after the absolute alcohol has been added, and test their action on some animal, say rabbits. We find always that the first and second produce identical results—those of snake-poisoning, while the third is always harmless. It follows that the fluid venom contains some material which can be extracted by the use of absolute alcohol, and to which the venom owes its virulent power. The next question which naturally arises is, what is the nature of this material? A series of chemical experiments showed that it belongs to the class of substances formed of a combination of carbon, oxygen, hydrogen, nitrogen, and sulphur, to which chemists have given the name of proteids, and of which a very good example is albumin, or white of egg. That the poisonous effect is due only to the presence of these albuminous substances is proved by the fact that everything, such as absolute alcohol, which removes the former from the venom, renders what is left behind perfectly harmless. If, also, we subject the venom to conditions—such, for example, as long boiling—which are known to alter and decompose proteids, then the virulent is changed into a harmless fluid. There are a considerable number of these proteids or albuminous substances, and by careful investigation Messrs. Martin and Smith discovered that the poisonous element is associated with special forms known as albumoses. These albumoses are substances made by the addition of the elements contained in water to albumins, and are produced, for example, by the action of gastric juice on an albumin, such as white of egg, taken in as food, or in some not yet understood way by the action on albumin of the cells which constitute different organs of the body. They are of great importance in the case of various diseases, such as diphtheria. The diphtheria bacillus, or germ, produces in the body a ferment which, when it comes in contact with proteids taken in as food, forms out of them certain of these albumoses, and it is the action of these which gives rise to the abnormal conditions which we recognise as the disease diphtheria. So again, in a slightly different way, the anthrax germ forms albumoses; and it is most suggestive to find an identity of structure in the poisonous elements present in the case of diphtheria, anthrax, and other diseases, and in snake-venom. In the poisonous snakes there is present a special poison-gland on each side of the head, which consists of a mass of cells, by which the venom is manufactured. The blood carries albuminous material to the gland; and here, Messrs. Martin and Smith suggest, the cells of the gland exert some special direct influence on it, and so transform it into the poisonous albumoses which, when the snake bites, pass down a little tube to the poison-fang, and so into the animal bitten.

SCIENTIFIC SOCIETIES.

Zoological Society of London.

June 19th, 1894.—Dr. A. Gunther, F.R.S., V.-P., in the chair.

Mr. Sclater exhibited the skin of a Monkey of the genus *Cercopithecus*, and pointed out that it belonged to the local form referred to in his recent paper on the *Cercopitheci* as *Cercopithecus diana ignitus*. He also exhibited the type specimen of *Cercopithecus grayi*, Fraser, which was formerly in the Knowsley collection, and which, in his opinion, was identical with *C. erxlebeni*, Pucheran.

Mr. H. Scherren exhibited a bottle in which an amphipodous crustacean (*Amphithoe littorina*) had built a nest with runs of sand and pieces of weed.

Prof. Ray Lankester read a paper on the external characters which distinguish the two Dipnoid fishes, *Lepidosiren* and *Protopterus*, and expressed the opinion that they should be referred to distinct genera.

Dr. G. H. Fowler exhibited the horns of a Fallow Deer belonging to Mr. J. A. R. Wallace, of Loch Ryan, which showed the effect of the removal of one testis on the development of antlers; and made remarks on the effect of different degrees of castration upon antlers, as shown by specimens in the Museum of the College of Surgeons. The continuity of variation displayed in the total lengths, and lengths of brow- and tray-tines, in abnormal antlers in the Natural History Museum, was also commented upon.

Mr. P. Chalmers Mitchell gave an account of his observations on the perforated flexor muscles in certain birds recently dissected in the laboratory in the Society's Gardens.

Messrs. R. R. Mole and F. W. Urich communicated biological notes upon some of the Snakes of Trinidad, with a preliminary list of the species of Ophidians recorded from that island.

A communication was read from M. E. Simon, containing the second portion of a memoir on the Spiders of the Island of St. Vincent, based on specimens obtained through the agency of the Committee for the exploration of the Natural History of the West Indies.

Mr. W. E. Collinge communicated a description of a new species of Slug of the genus *Janella*, from New Zealand, with a detailed account of its anatomy.

A communication was read from Mr. R. J. Lechmere Guppy, containing an account of some Foraminifera from the Microzoic Deposits of Trinidad.

Mr. Arthur E. Shipley read notes on some Nematode Parasites obtained from animals formerly living in the Society's Gardens.

Messrs. F. E. Beddard and P. Chalmers Mitchell gave an account of the anatomy of *Palamedea cornuta* as compared with that of its allies.

A communication was read from Dr. A. G. Butler on a collection of Lepidopterous Insects made by Dr. J. W. Gregory during his recent expedition to Mount Kenia. The specimens were referred to 215 species, of which ten were stated to be new to science.

This meeting closed the session 1893–94.—P. L. Sclater, *Secretary*.

NOTICES OF NEW BOOKS.

The Royal Natural History. Edited by Richard Lydekker: with Preface by P. L. Sclater. In six volumes; illustrated with 72 coloured plates and 1600 engravings. Vol. I., pp. i.—xvi.; 1—584. London: F. Warne & Co. 1894.

The Editor and Publisher of this important work may well be congratulated upon its satisfactory progress. Designed to appear in thirty-six monthly parts, nine of these (or one-fourth of the work) have now been published, and the first six parts complete the first volume, for which the title-page, contents, and index have been issued with part vii.

Commencing with the Mammalia, chapter i. deals with the principles of classification, general structure, and characteristics; chapters ii.—viii. are devoted to the Apes, Monkeys, and Lemurs; chapters ix.—xi. to Bats; chapter xii. to the Insectivora; chapter xiii. to the Cat-tribe; chapter xiv. to Civets, and Wolf and Hyænas; and chapter xv. to Dogs.

The more we have looked into the work the more we have marvelled at the price at which it is being issued. Seeing that each part contains about one hundred pages of letter-press, well-printed and on good paper, fifty or sixty engravings, and two coloured plates, we should consider it cheap at five shillings a part, whereas the actual cost of each number is one shilling net!

It ought to have an enormous circulation, and, as an aid to the diffusion of zoological knowledge, we hope it may. Mr. Lydekker seems to have spared no pains in the preparation of the text, and so far as we have been able to test it, the information in most cases is well up to date. Extracts are given from the most authoritative writers on special groups of animals, and we have only to suggest, by way of improvement, that the titles of the works or articles quoted should be mentioned in foot-notes, in order that the reader may be enabled to get fuller information, if desired, on particular points which the editor, with a view to economising space, has perhaps been compelled to treat a little too briefly.

As regards illustration, we are inclined to think that in the parts before us this has been a little overdone. There can be no need to give several figures by different artists of the same species; one good figure is all that is required, and a bad one is worse than none at all. We have noted several which are by no means satisfactory, because the drawing is inaccurate, and they would have been better omitted. No one, for example, ever saw a true Wild Cat, *Felis catus*, with a white foot, an Otter with a recurved tail, or a Ferret with a bushy tail like a Marten. The Shrews figured on page 328 are positive deformities, and a Pipistrelle (p. 274), Indian Mungoose (p. 469), Beech Marten (ii., p. 53), Sable (p. 55), and Mink (p. 68), are as unlike the originals as it is possible to make them. Still, these are exceptions, and the majority of the illustrations, especially those drawn by Wolf and Zwecker, are true enough in outline, and characteristic as regards their attitudes.

We trust that, with the issue of the last part, the editor will see his way to give a scheme of General Classification, according to the latest information, and indeed it would have been useful to supply this by instalments at the head of each section. For example, a key to the families and genera of Apes, Monkeys, and Lemurs would have been of great assistance to the uninitiated reader, who without it must experience a sense of great bewilderment in dealing with so large a number of species as are placed before him.

But the aim of the work is distinctly good, and, so far as we are able to judge, it is conscientiously and ably carried out.

British Birds; being Coloured Illustrations of all the Species of Passerine Birds resident in the British Isles, with some Notes in reference to their Plumage. By CLAUDE W. WYATT. 4to. London: W. Wesley & Son. 1894.

MR. WYATT's name will be favourably remembered in connection with a Monograph of the *Hirundinidæ* which he published in co-operation with Dr. R. B. Sharpe.

The present handsomely illustrated quarto, now before us, deals with the resident British *Passeres*. Fifty species are figured (most of them life-size) on twenty-five plates, and the drawing and colouring are extremely good. So good are they, that there is very little room for improvement; the most noticeable defect being in the outlines of the beaks in the *Corvidæ*, which appear to us to be too small and slender in proportion to the size of the birds. The figures are so grouped as to bring several species of one genus on the same plate, so that the allied forms may be easily compared. The three plates of *Paridæ* should have been brought nearer together, instead of being separated by the interposition of the Dipper and the Reed Bunting, and although the Tree Pipit is not a resident species, it might well have been figured on the same plate as *Anthus pratensis* and *A. obscurus*, for which there is plenty of room, in order that the Meadow Pipit and the Tree Pipit, which are so frequently confounded by ordinary observers, might be compared side by side.

Opposite each plate we find a few lines of explanatory letterpress, of which, it seems to us, there is too little. A page of type would not have been too much to do justice to the subject. The information given relates almost exclusively to the seasonal changes of plumage, and is by no means exhaustive.

No mention is made of the white-headed form of the Long-tailed Tit, and *Parus britannicus* is accepted as a good species without any indication of the characters by which it may be distinguished from *P. ater*. In a long series it seems to us impossible to separate them, the intergradation between the two forms being so gradual. There may be appreciable differences between specimens at both ends of a long series, but the intermediate forms might be referred to either *P. ater* or *P. britannicus* indifferently. This being so, we do not see how the latter can be regarded as a good species.

Mr. Wyatt states (p. 11) that the Rock Pipit is usually associated with rocky sea-coasts where it breeds, and that it frequents also the flat sea-coast. He might have added that it is to a certain extent migratory, and that in spring and autumn it is found inland at a considerable distance from the sea.

The Wood Lark, *Alauda arborea*, is included by Mr. Wyatt amongst the resident British *Passeres*, but there is reason to believe that this bird, like the Pied Wagtail, leaves the country in large flocks at the approach of winter, and that the northern limit of its winter range takes in the southern counties of England.

We are informed by the Preface that it is proposed to publish as a continuation of this work, and uniform with it, Illustrations of all the species of Passerine birds which are migrants to the British Islands, omitting the occasional visitors, and in a subsequent volume the resident and migratory *Picariæ.* This will be an expensive undertaking, but we trust, for the sake of the enthusiastic author, that the list of subscribers' names (which are received by Messrs. Wesley & Son) may be sufficiently long to justify him in carrying out his intention.

Alternating Generations: a Biological Study of Oak-galls and Gall-flies. By HERMANN ADLER, M.D. Translated and edited by CHARLES R. STRATON. Post 8vo, pp. i—xliii; 1—198. With Coloured Plates and other Illustrations. Oxford: Clarendon Press. 1894.

IN an excellent Introduction of forty pages, with which Mr. Straton paves the way for his translation of Dr. Adler's essay, he gives not only a clear review of the chief literature on the subject of galls, but an instructive *resumé* of the different views which have been expressed by eminent naturalists as to the cause or causes of their formation. Darwin, and many writers before him, held that gall-formation was due to a chemical secretion injected by the gall-insect; Malpighi considered that it acted as a ferment on juices existing in the plant; and this was the view of Réaumur, but he added to it the thermal effect of the egg, and the nature and character of the wound, which varies according to the shape of the ovipositor of each species. Dr. Derham thought the formation was partly due to the act of the plant, and partly to some virulency in the juice, or egg, or both, reposited on the vegetable by the parent animal, and just as this virulency is various according to the difference of its animal, so is the form and texture of the gall excited thereby.

Darwin speaks of galls as produced by a minute atom of the poison of a gall-insect, and compares them to the specific local processes of zymotic diseases. Sir James Paget, in 1880, expressed the view that "the most reasonable, if not the only reasonable theory, is that each insect infects or inoculates the leaf or other structure of the chosen plant with a poison peculiar to itself."

This, says Mr. Straton, may be taken as the view accepted by scientists until Dr. Adler, of Schleswig, in the essay now translated, showed conclusively that there is no foundation for supposing that the gall-insect injects any irritating secretion whatever; and Beyerinck has proved that the fluid ejected by the gall-fly is without taste or smell, and absolutely unirritating if injected under the skin. It is probably nothing more than a very mild antiseptic dressing applied to the wound made in the plant. Both these authors show plainly that it is not in the gall-mother, but *in the larva*, that we must seek for the cause of gall-growth; and that it is the nature of the salivary secretion, and the manner of feeding of the larva (peculiarities inherited by each species), which give the characteristic growth to the gall.

In the monograph here translated, Dr. Adler has described those oak-galls and gall-flies which are most commonly found in this country, except the Devonshire marble-gall, *Cynips kollari*, which does not occur in Germany north of the Elbe. But as this is one of the most familiar galls on English oaks, the translator has added a description of it in an Appendix. He has also added a synoptical table of galls, which will be extremely useful to those who are just taking up the subject, a short bibliography, and a classified list of the *Cynipidæ*.

Dr. Adler's work was well worth translating, and Mr. Straton has done it very well, elucidating the text with notes of his own, which he has judiciously placed within brackets. On two of the folding coloured plates, which have been very carefully chromolithographed by Messrs. West, Newman & Co. from Dr. Adler's drawings, are depicted a large number of galls with, in some cases, the flies magnified; and in another plate, in which the figures are all drawn from photographs, we see the different forms of ovipositor, with the egg, when accompanying it, drawn to the same scale. The subject is one which, we can well imagine, many people would find very fascinating.

RITIS